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CONCEPT AND ECOLOGICAL PROGRAMME « CHIMCO » COMPANY

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RESUME

CHIMCO-EAD est un grand producteur de produits chimiques et d'urée et sa part des exportations mondiales d'urée atteint 3 %. Les installations sont construites avec les technologies et les projets d'importantes sociétés de l'Europe de l'Ouest, comme « ICI », « Humphreys & Glasgow », « Stamicarbon » et ont démarré en 1967. Au cours des deux dernières décennies, la pollution globale de l'environnement, suite au rapide développement industriel, a entraîné l'introduction de normes sévères concernant les émissions dangereuses dans l'air, l'eau et le sol. En conséquence, certaines des unités de la société ne satisfont pas les exigences actuelles.

La conception de la gestion de la société en vue de résoudre les problèmes d'environnement repose sur les principes de base suivants :

- *Identification des sources de pollution et détermination des causes des émissions ;*
- *Préparation d'un programme avec les différentes étapes à réaliser ;*
- *Annonce du programme ;*
- *Rapport périodique à la société et aux autorités de contrôle compétentes ;*
- *Information ciblée de la société sur l'environnement concernant le danger réel des substances nocives émises par les activités productrices de la société.*

Le Programme Environnement de CHIMCO comporte la réalisation de projets en vue de changer les technologies et les procédés existants susceptibles d'empêcher le rejet de résidus du cycle de production et de réduire la pollution. Les résultats concrets et ceux escomptés de la réalisation du programme environnement de notre société sont indiqués dans la communication.



« CHIMCO »-EAD is a large-scale ammonia and urea producer and has 3% of the total world urea exports. The main urea and ammonia production facilities are built in accordance with technologies and engineering from leading West-European companies « ICI », « Humphreys & Glasgow » and « Stamicarbon » and were started-up in 1967. The urea and ammonia production has been increased by building new facilities in accordance with the world trend of increased urea application in the fertilizer sector in the period 1980-82. At the moment CHIMCO operates five ammonia plants - 100 000 t/y each, and seven urea production plants with total capacity of 800 000 t/y. In 1970 a plant for production of carbon disulphide on the basis of natural gas and sulphur was built in accordance with the project of the Italian company « Snia Viscosa ».

At the moment of building of the production facilities, the technologies for ammonia, urea and carbon disulphide production have been in accordance with the developed West-European countries ecological requirements, that were then significantly higher than the ones in our country.

For the last two decades the global pollution of the environment resulting from the quick industrial development had resulted in the implementation of significantly severe standards for harmful substance emissions to the air, water and soil. This process is continuing, particularly so in our country over the last few years. As a result, some of the company plants do not conform to the contemporary requirements. The efforts to harmonise the standards of our country with the European standards in 1991-1993 increased even more this discrepancy.

Under the Bulgarian legislation, the enterprises are obliged to implement environmental production, repair and investment activities.

All new plants construction projects, as well as projects for reconstruction and extension of the existing facilities and facilities in operation must first be submitted for environmental evaluation with the relevant control authorities.

The state imposes sanctions and penalties for environmental regulation infringements. The control authorities issue mandatory recommendations for implementation with the main goal of eradicating the negative influences on the environment.

The concept of Chimco management for solving the ecological problems has the following basic principles:

- Identification of the sources and reasons for the emissions exceeding the established ones, as per the Bulgarian, West-European and North American standards;
- Preparation of a program of measures - technical and organizational - for solving of the ecological problems with estimation of the size, the necessary financial funds and the expected results;
- Announcing of the program to the relevant local and central authorities and to the community with the help of the mass media and other suitable ways;
- Periodical - (minimum two times per annum) report to the relevant authorities and community by means of mass media, special press conferences and other ways, reflecting the implementation of the Ecological Program;
- Raise awareness of the community to the danger of the company pollution emissions to the atmosphere, water and soil, flora and fauna and the people. The results of the investigations by independent companies and institutions on the actual influence on the environment and people's health are to be announced.

The proximity of the production facilities to the residential buildings of the town of Vratza obligates the company to implement continuous control on the harmful substances emissions to atmosphere and into the waste waters.

The pollution of the water and air by « CHIMCO » is done primarily by the ammonia and urea emissions from the urea and ammonia production plants, by the sulphur dioxide emissions from the carbon disulphide production plant and by nitrogen oxides emissions - from the thermal power station and the ammonia production plants.

The main gaseous emissions of harmful substances in the region of the town of Vratza, which is close to where the company is situated, and the relative share of « CHIMCO » emissions as of November 1995 are shown in Table 1.

Table 1

No.	Emission	Relative share %
1.	Sulphur dioxide	61.8
2.	Nitrogen oxides	40.1
3.	Urea dust	100.0
4.	Ammonia	100.0
5.	Carbon dioxide	0.3

In reference to the ammonia and urea dust « CHIMCO » is the only organized source, and it is one of its main ecological problems.

Another ecological problem are the emissions, discharged by the total waste waters effluents from company production plants.

The absolute quantities of these effluents substances as of November 1995 are shown in Table 2.

Table 2

No.	Substance	Unit	Average
1.	Nitrogen - ammonium	kg/h	31.3
2.	Urea	kg/h	52.3
3.	Nitrogen - nitrite	kg/h	0.6
4.	Sulphates	kg/h	67.66
5.	Permanganate oxidability	kg/h	4.0
6.	Insoluble substances	kg/h	21.0

at average annual flow rate 540 m³/h.

in the last 10-15 years, there were a lot of improvements and reconstructions implemented at « CHIMCO » in accordance with urea and ammonia production technology development. The operation with arsenic oxide, used as an activator of the solution for carbon dioxide removal from the synthesis gas in the reformer plant, has been stopped. The process waste condensates from the same plant, 60 m³/h, containing ammonia and hydrocarbons downstream the stripper are recycled back to the process. The ammonia emissions from the urea production plants to the air were decreased by about 2000 t/y. The 1982 hydrolyzer stripping system to 7-th technological urea production train decreased almost ten times the ammonia and urea emissions to the waste waters. During the time period that technology was one of the most progressive ecologically with many technological and constructive improvements, which are widely applied with the urea production plants today.

The technological modifications significantly improved the ecological situation, but were exhausted of the possibilities for the urea plants which were built in accordance with technologies of 1960s.

At the same time, due to the natural depreciation of 25 years' operation, the technical reliability of part of the equipment is reduced and this additionally increases the ecological risk.

The reduction of the harmful emissions in accordance with the new standards requires significantly bigger investments.

The alternatives for the realization of this purpose could be principally three:

- **First** - to build classical purifying equipment, that eliminates the harmful substances by chemical or biological / where possible / decomposition and transformation into harmless or less harmful compounds. Having in mind the specifics of the urea and carbon disulphide production, this alternative is technologically inexpedient and extremely inefficient economically.
- **Second** - to build new and to stop operating facilities over 25 years. This alternative requires large investments, which, with the economic conditions in Bulgaria of transition from central planned to market economy, could not be provided. It is problematic to attract such a large foreign investments.
- **Third** - in accordance with the contemporary development and condition of the chemical technology and the technique for its realization, to **modify the existing or introduce new processes, with which the harmful substances / in this case feed raw materials/ are not discharged out of the technological process.** With the urea and carbon disulphide production plants this is possible by increasing the rate of conversion of feed raw materials, recycling of non-reacted products and processing at parameters, eliminating or significantly decreasing the emissions quantity.

« CHIMCO » chose the third alternative, which allows simultaneously the solution of the ecological problems and technological renewal of part of the production facilities, all closely related to increasing the technical reliability and safety of the equipment, improving the quality of the products and increasing the economical efficiency and market competitiveness.

Here are some concrete examples of the company's Ecological program by production facilities reconstruction which have been implemented.

1. **The prilling of urea** is done in four prilling towers with significant dust formation and granulometry, not conforming to the current market requirements. In accordance with the technology of « UTI », USA a reconstruction of the 1982 prilling tower on 7-th technological urea production train has been made. The reconstruction consists of entering into operation of static prill-heads, compulsory feeding of cooling air and cross air counter-flow with the forming urea prills. The reconstructed tower is expected to accept urea for prilling from the rest of the three towers, which will be decommissioned later. As a result of that there will be a reduction of emission urea dust to atmosphere by 2000 tons per year. A successful test at 87% capacity of the reconstructed prilling tower has been made with actual shut-down of two of the old prilling towers. The top mounted tower demister device decreases the urea dust and ammonia emissions below 20 mg/Nm³. After entering into exploitation of the inter-connected job-site « Evaporation II stage », all the old prilling towers will be shut-down and the reconstructed tower will be loaded to 100% capacity, with guarantees for compliance to the standards for ammonia and urea dust emissions to atmosphere.
2. With the carbon disulphide production plant the waste hydrogen sulphide from the process is treated in the classical two-staged Claus Plant to elementary sulphur. The quantity of the sulphur dioxide emitted to atmosphere was in infringement with the current Republic of Bulgaria standards.

The studies show that the most suitable method for our conditions method is gas treatment downstream in the Claus Plant by catalytic reduction of the sulphur compounds to hydrogen sulphide, absorption with suitable absorbent and recycling to the plant. This method became very popular in the last few years and there are more than 100 plants in the world in operation with this method. Its main advantage is that it unites two well-known chemical processes and gives the possibility for very high level of purification of the waste gases by converting the harmful sulphur compounds into feed raw material for the production of carbon disulphide. This operation will stop the emission of 2480 tons/year of sulphur dioxide to the atmosphere.

3. **Decreased ammonia emissions in the waste waters** is achieved by many technical measures at sources of their formation and also by using a new independently operating Hydrolyzer- Stripping Plant. **These improvements can lower the concentration of ammonia to 20-25 mg/l and urea to 5 mg/l in the purified waters, with the recycling of ammonia and carbon dioxide in the form of ammonium carbamate to the urea production process.** The purified waters meet the requirements for boiler and medium pressure turbines feed water and as such they will be used with the ammonia plants. This allows the content of ammonia and urea in the total waste water effluent from the plant to be reduced significantly. In the period 1990-1995, the ammonia and urea concentrations in CHIMCO waste waters were halved the ammonia / as nitrogen - ammonium / from 118-120 mg/l to 59.3 mg/l; the urea from 228 mg/l to 98.6 mg/l.
4. With the realization of project « Natural gas saturation » all the waste condensates, containing ammonia from the ammonia and urea production plants, will be utilized. Through this technology the waste condensates will be recycled to the production process as boiler feed water and complete utilization of the captured ammonia will be achieved.
5. **Another source of harmful substances emission in the company's waste waters is the 1966 boiler water treatment plant, necessary for the Thermal Power Station and chemical production plants.** The treatment is done in accordance with the classical technology with ion-exchange resins. The high level of pollution of the river Iskar waters - the main company water source - is the main reason for the very high consumption of chemical reagents and additional pollution of the company total effluent waters.

A new plant for production of deeply demineralized water, in accordance with the project of « RAUMA ECOPLANNING », Finland, is just before a start - up. The high quality of the water and the reduction of the quantity of the chemical reagents for its treatment is achieved by the application of contemporary physical methods - ozonating and reverse osmosis. The liquid waste waters are practically eliminated by using an evaporation plant.

After the erection of the new water treatment plant the following ecological and technological results are expected:

- high and automatic maintenance of the softened water quality;
- reduction of the waste products from the ion regeneration from 9406 t/y to 3401 t/y;
- decreasing of the consumption of sulphuric acid 14 times and of the sodium base 3,5 times;
- ten times reduction of the raw water consumption for water treatment own needs;
- the slime from the pre-treatment and the dry salt residue are fed to the built for the purpose storage tanks. The possibilities for utilizing of the solid salt residue, for example in the glass industry, are being studied at the moment.

The above mentioned concrete examples do not include the whole complex of technological and technical measures, expected to be realized with the company ecological program. The environment protection is a process, closely connected with the whole production and engineering activity and with financial implications.